# Metal Progress

## Volume 73
## January 1958 thru June 1958


ERNEST E. THUM, *Editor-in-Chief*

ALLEN G. GRAY, *Editor*

MARJORIE R. HYSLOP, *Managing Editor*

*Assistant Editors*

DAVE RITCHIE

CARL R. WEYMUELLER

FLOYD E. CRAIG, *Art Director*



*Metal Progress Is Owned and Published by*

THE AMERICAN SOCIETY FOR METALS

7301 Euclid Avenue, Cleveland 3, Ohio

Copyright, 1958

by

The American Society for Metals

Printed in U.S.A.

# Subject Index

**The subject headings used in this index are chosen in accordance with the ASM-SLA Metallurgical Literature Classification, International (Revised) Edition, published by the American Society for Metals, 1958.**


**Adhesive joining**
Bonding Magnesium Sheet *(d)* ..... 5-130

**Aging**
Can an Improved Nonaging Steel Be Produced Commercially?, by Eric R. Morgan ..... 6-88

**Aircraft**
A Definitive Study of Aircraft Fatigue, reviewed by Leo Schapiro *(br)* ..... 2-91
Materials for Rocket Engines, by R. C. Kopituk ..... 6-79
PH Stainless for Hot Airframes, by R. W. White ..... 6-74
Vertical Take-Off and Landing, by Lawrence J. Hull ..... 2-68

**Aluminum**
Atomized Powder Alloys of Aluminum, by R. J. Towner ..... 5-70
The French Aluminum Industry, by Georges A. Baudart ..... 1-72
Galvanic Corrosion of 2024 Aluminum, by F. Pearlstein *(d)* ..... 3-188
High-Strength Aluminum Casting Alloy *(d)* ..... 4-138
Mechanism of Sintering Aluminum Oxide *(d)* ..... 5-202
Nitrogen and Vacuum Degassing of Al-Si-Mg Alloy *(d)* ..... 5-178
Periodic Markings on Electropolished Aluminum, by N. C. Welsh *(d)* ..... 6-186
Wedge Welding of Unlike Metals, by Wilhelm Hoffman *(d)* ..... 2-152

**American Society for Metals**
American Society for Metals New Headquarters, by William H. Eisenman ..... 5-67

**Annealing**
Annealing Furnace for Motor Laminations *(d)* ..... 3-154
New Method Speeds Annealing (staff report) ..... 6-97

**Anodizing**
Periodic Markings on Electropolished Aluminum, by N. C. Welsh *(d)* ..... 6-186

**Atomic energy**
Controlled Thermonuclear Reactions *(aa)* ..... 3-107
Detection of Bomb Tests (na) ..... 6-109
Underground Atomic Explosions ..... 5-77

**Atomic power**
British Nuclear Energy Developments *(d)* ..... 5-140
Forecast of Nuclear Power Development, by W. Kenneth Davis and Louis H. Roddis, Jr. *(d)* ..... 6-158
Heating With an Electron Beam *(cp)* 5-65
Nuclear Power in Europe, by Andrew W. Kramer ..... 1-76
Nuclear Power in Great Britain *(d)* ..... 4-179
The Windscale Incident, by Tom Bishop *(aa)* ..... 1-114
The Windscale Incident (Wigner Energy Release), by T. Bishop *(c)* ..... 6-116

**Austenite decomposition**
Kinetics of Austenite Decomposition *(d)* 5-180

**Automation**
Automation in Heating and Quenching, by Norbert K. Koebel ..... 2-72

**Bearings**
Heat Treating of Roller Bearings Is Geared to Automatic Production, by Leo H. Everitt and O. E. Cullen ..... 6-67
Oil-Free Bearings, by H. S. White *(d)* 6-194

**Beryllium**
Outlook for Beryllium *(d)* ..... 5-148
Properties and Fabrication of Beryllium, by L. David *(d)* ..... 6-192
Semicontinuous Casting of Beryllium Copper, by K. G. Wikle ..... 4-85

**Biographies**
Lloyd Montgomery Pidgeon, an Eminent Living Metallurgist, by Harold J. Roast ..... 2-104
G. MacDonald Young, President, A.S.M., 1957-58 ..... 4-79

**Bismuth**
Bismuth Alloys *(d)* ..... 4-188

**Bonding**
Bonding Soft Metals to Semiconductors *(d)* ..... 5-196

**Boron**
Improvement in High-Temperature Alloys by Boron and Zirconium, by W. J. Pennington ..... 3-82

**Brittleness**
Brittleness in High-Manganese Stainless, by H. J. Beattie, Jr. *(c)* ..... 2-114
Chevron Patterns in Steel Fractures, by C. F. Tipper *(d)* ..... 3-145
Effect of Phosphorus and Manganese on Temper Brittleness *(d)* ..... 5-172
Embrittlement in Welded Heat Resisting Steels, by Henry F. Tremlett *(d)* ..... 6-178
Hydrogen Embrittlement by Furnace Atmosphere, by S. Gunnerson *(d)* ..... 1-196

**Carbo-nitriding**
Surface Fatigue of Carbo-Nitrided Steel, by G. W. Powell, M. B. Bever and C. F. Floe ..... 3-67

**Carburizing**
Carburizing, reviewed by E. E. Thum *(br)* ..... 3-110
Hydrogen Embrittlement by Furnace Atmosphere, by S. Gunnerson *(d)* ..... 1-196

**Cast iron**
Cast Iron—How and Where to Use It *(br)* ..... 6-113
Casting for Customers *(cp)* ..... 4-65
Continuous Casting of Gray Iron, by Adalbert Wittmoser ..... 1-83
Formation Mechanism of Graphite Nuclei, by A. F. Landa and V. D. Yakhnina *(d)* ..... 6-152
Influence of U[illegible]erstressing on Fatigue, by G. N. J. Gilbert and K. B. Palmer *(d)* ..... 3-140
Permanent Mold Castings, by A. M. Petrichenko *(d)* ..... 1-198

**Cast iron, malleable**
Castings for Tougher Jobs, by Carl F. Joseph ..... 5-104
Pearlitic Malleable Iron—an Industry Report, by James H. Lansing ..... 5-102

**Cast iron, nodular**
Better Test for Ductile Iron *(d)* ..... 5-126
Gas Flushing of Nodular Iron, by Wilhelm Patterson, *(d)* ..... 3-198
Grain Refinement of Ferritic Nodular Irons, by G. N. J. Gilbert *(d)* ..... 6-180

**Casting**
Semicontinuous Casting of Beryllium Copper, by K. G. Wikle ..... 4-85

**Casting, continuous**
Continuous Casting of Gray Iron, by Adalbert Wittmoser ..... 1-83

**Casting, permanent mold**
Permanent Mold Castings, by A. M. Petrichenko *(d)* ..... 1-198

**Casting, precision investment**
Investment Casting of Precious Metal Jewelry, by Ralph H. Atkinson ..... 2-97

**Castings**
Cast Alloy Fixture Has Long Life in Thermal Shock Service, by E. A. Schoefer ..... 6-106
Casting for Customers *(cp)* ..... 4-65
Role of Strain Rate in Hot Cracking in Castings, by H. F. Bishop, C. G. Ackerline and W. S. Pellini *(d)* ..... 3-158

**Cemented carbides**
Brittleness of Carbides, by E. B. Fischer *(c)* ..... 5-114

**Ceramic coatings**
Refractory Oxide Coatings, by Neil N. Ault, *(d)* ..... 3-141

**Cermets**
Cermets in Jet Engines, by J. W. Graham and W. F. Zimmerman 4-108
Mechanism of Sintering Aluminum Oxide *(d)* ..... 5-202
What's Hapened to Cermets? by J. W. Graham and W. F. Zimmerman .. 3-89

**Chromium**
Uncommon Metals Ready to Solve Difficult Problems, by J. P. Denny and L. F. Kendall *(d)* ..... 6-136

**Cleaning**
Descaling of Titanium, by W. B. Stephenson, Jr. ..... 3-87

**Coating**
Molybdenum at High Temperatures, by J. J. Harwood *(d)* ..... 3-194

**Columbium**
Forming and Joining Columbium, by F. G. Cox *(d)* ..... 1-178
Uncommon Metals Ready to Solve Difficult Problems, by J. P. Denny and L. F. Kendall *(d)* ..... 6-136

**Copper**
Semicontinuous Casting of Beryllium Copper, by K. G. Wikle ..... 4-85
Wedge Welding of Unlike Metals, by Wilhelm Hoffmann *(d)* ..... 2-152
Zone Refining of Copper *(d)* ..... 5-158

**Corrosion**
Corrosion and Abrasion Effect on Ferrous Metals *(d)* ..... 4-144
Galvanic Corrosion of 2024 Aluminum, by F. Pearlstein *(d)* ..... 3-188
Liquid Metal Corrosion, by W. D. Manly, *(d)* ..... 3-132

**Corrosion tests**
Investigation of Corroded Parts, by J. B. Cotton and R. J. Watkins *(d)* ..... 3-146

**Cracks**
New Mechanism Suggested for Ingot Cracks, by P. Bjornson and H. Nathorst *(d)* ..... 2-142
Role of Strain Rate in Hot Cracking in Castings, by H. F. Bishop, C. G. Ackerline and W. S. Pellini *(d)* ..... 3-158

**Crash programs**
"Climate" for Crash Programs *(cp)* .... 2-66
"Climate" for Crash Programs, by E. H. Snyder *(c)* ..... 5-114

**Creep**
Creep Properties of 18-8 Stainless Steel, by L. W. Larke and R. A. Whittaker *(d)* ..... 1-150

**Cutting fluids**
Cutting Fluid Selection — the Metal Makes the Difference ..... 2-102

**Degassing**
Nitrogen and Vacuum Degassing of Al-Si-Mg Alloy *(d)* ..... 5-178

**Die casting**
Automatic Feeding of Magnesium for Die Casting, by F. L. Burkett and F. C. Bennett *(d)* ..... 2-186
Review of Die-Casting Practices Abroad, by Donald L. Colwell ..... 1-88
Spark Plugs and Die Castings, by E. E. Thum *(cp)* ..... 6-65
Spindly Die Casting *(c)* ..... 2-116

**Direct reduction**
Iron by Direct Reduction, by A. Hegarty *(d)* ..... 3-192
The R-N Process for Direct Reduction of Iron Ores ..... 4-73

**Dislocations**
Dislocation Model, by J. Gurland *(c)* ..... 6-116
Etch Pits of 30 Years Ago, by W. J. Jones *(c)* ..... 4-114

**Editor**
A New Editor—An Expanded Editorial Field, by William H. Eisenman ..... 3-65

**Education**
Colleges Need Money From Industry *(cp)* ..... 4-67
Colleges Need Money From Industry, by John W. Vanderwilt *(c)* ..... 6-118
Note to Graduates, by P. Riebensahm *(c)* ..... 4-116
Progress of Metallurgy in Europe, by Hubert Sutton ..... 1-102


***(aa)* Atomic Age; *(br)* Book Review; *(c)* Correspondence; *(cp)* Critical Points; *(d)* Digest; *(ds)* Data Sheet; *(sr)* Short Runs**

**Electroplating**
Leveling Nickel, by D. Gardner Foulke *(d)* ... 3-202
Multilayer Nickel Coatings (staff report) ... 6-95
Nickel Plating of Jet Engine Parts, by R. W. Moeller and W. A. Snell *(d)* ... 1-182
Stress-Free Nickel Plating ... 4-90

**Engines, aircraft**
Materials for Rocket Engines, by R. C. Kopituk ... 6-79
Nickel Plating of Jet Engine Parts, by R. W. Moeller and W. A. Snell *(d)* 1-182

**Engines, jet**
Cermets in Jet Engines, by J. W. Graham and W. F. Zimmerman ... 4-108
What Price Titanium?, by E. E. Thum *(ep)* ... 6-66

**Etch pits**
Etch Pits of 30 Years Ago, by W. J. Jones *(c)* ... 4-114

**Extrusion**
Cold Working for Metals at Ford *(d)* ... 4-132
Forming Titanium Extrusions *(d)* ... 5-188

**Fasteners**
Titanium Rivets (d) ... 4-172

**Fatigue**
Damage by Uncontrolled Shot Blasting, by Konrad Kornfeld ... 2-92
A Definitive Study of Aircraft Fatigue, reviewed by Leo Schapiro *(br)* ... 2-91
Effect of Surface Roughness on Fatigue Strength, by E. Siebel and M. Gaier *(d)* ... 1-174
Fatigue Properties of Cast and Wrought Steels *(d)* ... 4-150
Influence of Understressing on Fatigue, by G. N. J. Gilbert and K. B. Palmer *(d)* ... 3-140
Metal Fatigue, by George R. Gohn *(d)* ... 2-193
Movies Record Metal Fatigue *(d)* ... 1-188
Surface Fatigue of Carbo-Nitrided Steel, by G. W. Powell, M. B. Bever and C. F. Floe ... 3-67

**Ferro-alloys**
Ferromanganese From Lean Ore, by B. R. Nijhawan ... 1-112

**Flame cleaning**
Flame Washing in Steel Foundry *(d)* ... 5-158

**Forging**
Forging, by Harry W. McQuaid *(d)* ... 3-208
Oxidation of 18-8 Steel at Forging Temperature, by J. O. Edstrom *(d)* ... 1-171

**Forgings**
Forging Heat Treatment, by A. O. Schaefer *(d)* ... 2-140
Solid Forgings from Compacted Scrap Turnings *(d)* ... 4-176

**Foundry**
Flame Washing in Steel Foundry *(d)* ... 5-158

**Fracture**
Chevron Patterns in Steel Fractures, by C. F. Tipper *(d)* ... 3-145
Rupture Mechanism *(d)* ... 4-195
Tear Test for Titanium Sheet, by C. W. Vigor and J. R. Hornaday, Jr. ... 4-103

**Fuel, nuclear**
Fuel Elements for Economical Atomic Power, by Norman Hilberry *(c)* ... 6-122

**Furnace parts**
Cast Alloy Fixture Has Long Life in Thermal Shock Service, by E. A. Schoefer ... 6-106

**Furnaces, heat treating**
Annealing Furnace for Motor Laminations *(d)* ... 3-154
Automation in Heating and Quenching, by Norbert K. Koebel ... 2-72
Processing With Continuous Heating . . . an Economic Appraisal, by Frederic O. Hess ... 6-99

**Furnaces, heating**
Processing With Continuous Heating . . . an Economic Appraisal, by Frederic O. Hess ... 6-99

**Ghost**
Metallurgical Dragon, by R. R. Banerjee *(c)* ... 3-112

**Graduates**
Note to Graduates, by P. Riebensahm *(c)* ... 4-116

**Grain size**
Grain Refinement of Ferritic Nodular Irons, by G. N. J. Gilbert *(d)* ... 6-180

**Graphitization**
Formation Mechanism of Graphite Nuclei, by A. F. Landa and V. D. Yakhnina *(d)* ... 6-152

**H-iron process**
Iron Powder Made by the H-Iron Process, by Jerome Kuzmick and Kenneth W. Bruland ... 3-92

**Hafnium**
Thorium-Zirconium and Thorium-Hafnium Phase Diagrams, by E. D. Gibson, B. A. Loomis and O. N. Carlson *(d)* ... 1-142
Uncommon Metals Ready to Solve Difficult Problems, by J. P. Denny and L. F. Kendall *(d)* ... 6-136

**Hardenability**
End Quench Hardenability Test *(d)* ... 4-156
Hardenability Bands for Steels 4720-H to T50B60-H *(ds)* ... 1-96-B
Hardenability Bands for Steels 5120-H to 51B60-H *(ds)* ... 2-96-B
Hardenability Bands for Steels 6120-H to 8630-H *(ds)* ... 3-96-B
Hardenability Bands for Steels 8637-H to 8742-H *(ds)* ... 4-96-B
Hardenability Bands for Steel 9260-H to 9850-H *(ds)* ... 5-96-B

**Heading**
Cold Working for Metals at Ford *(d)* ... 4-132

**Heat resisting alloys**
Better Ways to Fabricate High-Temperature Materials ... 5-97
Cast Alloy Fixture Has Long Life in Thermal Shock Service, by E. A. Schoefer ... 6-106
Embrittlement in Welded Heat Resisting Steels, by Henry F. Tremlett *(d)* ... 6-178
Heat Resisting Steels, by H. Krainer *(d)* ... 2-192
High-Temperature Report Available, by Bertram A. Mulcahy *(c)* ... 6-120
Improvement in High-Temperature Alloys Boron and Zirconium, by W. J. Pennington ... 3-82
Nature of Oxides on Stainless Alloys, by John F. Radavich *(d)* ... 2-158
Stress-Rupture of Heat Resistant Alloys, by J. G. Sessler and W. F. Brown, Jr. *(d)* ... 3-128

**Heat transfer**
Heating at High Speed, by Norman H. Davies and Richard J. Reed ... 2-79

**Heat treatment**
Forging Heat Treatment, by A. O. Schaefer *(d)* ... 2-140
Heat Treating in Vacuum, by Horace B. Drever ... 3-108
Heat Treating of Roller Bearings Is Geared to Automatic Production, by Leo H. Everitt and O. E. Cullen ... 6-67
A Study of Temperature Uniformity in Heat Treating, by Harold N. Ipsen ... 5-89

**Heating, for working**
Heating at High Speed, by Norman H. Davies and Richard J. Reed ... 2-79
Modernization in Heating for Hot Forming, by Philip W. Morse ... 2-85

**History**
Carburizing, reviewed by E. E. Thum *(br)* ... 3-110
Thirty Years in American Metallurgy, by John J. B. Rutherford ... 2-106

**Hydrogen**
Hydrogen in Steel Mill Slags, by J. H. Walsh, J. Chipman, T. B. King and N. J. Grant *(d)* ... 3-174
Weather Influences Amount of Hydrogen in Steel, by T. W. Merrill *(d)* ... 6-153

**Identification**
Electrochemical Marking of Metal, by Ralph A. Botosan *(sr)* ... 4-111

**Inclusions**
Isolating Inclusions in Steel, by N. Backstrom, S. Heiskanen and U. Ilme, *(d)* ... 3-180
Removing Inclusions Ultrasonically (d) 5-202

**Induction heat**
Induction Hardening of Bearing Surfaces, by G. W. Seulen *(d)* ... 3-128
Metallurgy of Tempering and Annealing in Fractional Minutes, by R. K. Wuerfel ... 4-93
Modernization in Heating for Hot Forming, by Philip W. Morse ... 2-85
Surface Hardening by Induction Heating *(d)* ... 4-190

**Ingots**
New Mechanism Suggested for Ingot Cracks, by P. Bjornson and H. Nathorst *(d)* ... 2-142

**Iron**
Infiltration of Sintered Iron Compacts, by Robert L. Pettibone *(d)* ... 6-204
Iron by Direct Reduction, by A. Hegarty *(d)* ... 3-192
Iron Powder Made by the H-Iron Process, by Jerome Kuzmick and Kenneth W. Bruland ... 3-92
The R-N Process for Direct Reduction of Iron Ores ... 4-73

**Iron-aluminum alloys**
Coming: Better Thermenol Alloys, by W. J. Buehler and C. G. Dalrymple ... 5-78

**Iron industry**
Iron and Steel Needs of Argentina, by Juan B. DeNardo ... 1-109

**Isotopes**
Radioactive Gases Used As Luminous Light Sources, by C. W. Wallhausen *(d)* ... 6-202

**Jewelry**
Investment Casting of Precious Metal Jewelry, by Ralph Atkinson ... 2-97
Materials and Processes in Manufacture of Costume Jewelry, by Ralph H. Atkinson ... 3-74

**Light sources**
Radioactive Gases Used as Luminous Light Sources, by C. W. Wallhausen *(d)* ... 6-202

**Liquid metals**
Liquid Metals, by L. H. J. Harper *(d)* 2-180
Liquid Metal Corrosion, by W. D. Manly *(d)* ... 3-132

**Machine parts**
Sideline for Valvemaker Means Lots of New Parts *(ep)* ... 4-66

**Machining, electric**
Electric Discharge Machining *(d)* ... 4-196

**Machining, spark**
Electric Spark Machining, by G. R. Wilms and J. B. Wade *(d)* ... 1-138

**Macro-etching**
Macro-Etching for Quality Control, by Henry G. Keshian *(c)* ... 6-122

**Manganese**
Ferromanganese From Lean Ore, by B. R. Nijhawan ... 1-112

**Magnesium**
Automatic Feeding of Magnesium for Die Casting, by F. L. Burkett and F. C. Bennett *(d)* ... 2-186
Bonding Magnesium Sheet *(d)* ... 5-130
Hot Tearing of Magnesium Castings *(d)* ... 5-195

**Metallography**
Modern Metallography, reported by H. P. Roth ... 3-70
Recent European Advances in Optical Metallography, by Roland Mitsche ... 1-97
Thirty Years in American Metallurgy by John J. B. Rutherford ... 2-106

**Metallurgy**
Are Metallurgists Prepared for 19XX?, by R. F. Thomson ... 3-99
Metallurgy in Industry—a Look Ahead, by H. S. Turner ... 5-109
Progress of Metallurgy in Europe, by Hubert Sutton ... 1-102
Thirty Years in American Metallurgy, by John J. B. Rutherford ... 2-106

**Meteorites**
Missiles in Meteorites, by Pierre Jacquet *(c)* ... 4-114

**Microscopy**
Microscopes to Fit Students, by Raymond C. Boettner, *(c)* ... 3-112
Recent European Advances in Optical Metallography, by Roland Mitsche ... 1-97

**Missiles**
Missiles in Meteorites, by Pierre Jacquet *(c)* ... 4-114

**Molybdenum**
Molybdenum at High Temperatures, by J. J. Harwood *(d)* ... 3-194

**Nickel plating**
Leveling Nickel, by D. Gardner Foulke *(d)* ... 3-202
Multilayer Nickel Coatings (staff report) ... 6-95
Nickel Plating of Jet Engine Parts, by R. W. Moeller and W. A. Snell *(d)*.. 1-182
Stress-Free Nickel Plating ... 4-90

**Nuclear reactor components**
Fuel Elements for Economical Atomic Power, by Norman Hillberry *(c)* ... 6-122
Properties and Fabrication of Beryllium, by L. David *(d)* ... 6-192

**Nuclear reactors**
Mild Steel in Nuclear Applications, H. F. Beeghly *(d)* ... 3-178
Theory Versus Practice *(ep)* ... 5-66


***(aa)* Atomic Age; *(br)* Book Review; *(c)* Correspondence; *(cp)* Critical Points; *(d)* Digest; *(ds)* Data Sheet; *(sr)* Short Runs**

**Order-disorder**
Order-Disorder Science Simplified, reviewed by J. B. Newkirk *(br)* ..... 1-104

**Oxidation**
Effect of Impurities on Oxidation Mechanism, by Earl A. Gulbransen *(d)* ..... 3-148
Nature of Oxides on Stainless Alloys, by John F. Radavich *(d)* ..... 2-158
Oxidation of 18-8 Steel at Forging Temperature, by J. O. Edstrom *(d)* ..... 1-171

**Phase diagrams**
Thorium-Zirconium and Thorium-Hafnium Phase Diagrams, by E. D. Gibson, B. A. Loomis and O. N. Carlson *(d)* ..... 1-142

**Pickling**
How to Treat Pickle Liquors in a Small Plant, by Edward W. Lang ..... 5-93

**Pipe**
Joints and Piping for 5600-Psi. Steam, by Harry Blumberg *(d)* ..... 1-138

**Planishing**
Weld Failures Overcome By Roll Planishing, by H. L. Meredith and B. R. Russell *(d)* ..... 6-148

**Powder metallurgy**
Atomized Powder Alloys of Aluminum, by R. J. Towner ..... 5-70
Infiltration of Sintered Iron Compacts, by Robert L. Pettibone *(d)* ..... 6-204
Iron Powder Made by the H-Iron Process, by Jerome Kuzmick and Kenneth W. Bruland ..... 3-92
Report on Powder Metallurgy in the U.S.S.R., by Henry H. Hausner ..... 1-105
Sintered Steel From Darkest Africa *(d)* ..... 3-152

**Pyrophoric properties**
Metal Pyrotechnics, by Saul Haffner *(d)* ..... 2-172
Pyrophoricity of Metallic Titanium *(d)* 2-184

**Quenching media**
A New Quenchant for Steel, by P. E. Cary, E. O. Magnus and W. E. Herring ..... 3-79

**R-N process**
The R-N Process for Direct Reduction of Iron Ores ..... 4-73

**Radioactive materials**
Radioactive Gases Used as Luminous Light Sources, by C. W. Wallhausen *(d)* ..... 6-202

**Reaumur**
Carburizing, reviewed by E. E. Thum *(br)* ..... 3-110

**Refractories**
Electric Furnace Refractories, by E. C. Wright ..... 5-87

**Research**
Letter to Canada, by H. P. Tardif *(c)* ..... 4-116
Metallurgy in Industry—a Look Ahead, by H. S. Turner ..... 5-109
Progress of Metallurgy in Europe, by Hubert Sutton ..... 1-102

**Rhenium**
Uncommon Metals Ready to Solve Difficult Problems, by J. P. Denny and L. F. Kendall *(d)* ..... 6-136

**Rickover**
Theory Versus Practice *(cp)* ..... 5-66

**Rockets**
Materials for Rocket Engines, by R. C. Kopituk ..... 6-79

**Rolling**
Rolling Defects in Steel Sheet, by A. M. Armour *(d)* ..... 2-174
Smudge on Cold Rolled Sheet *(d)* ..... 5-186
Some Advances in Tinplate Technology, by W. E. Hoare ..... 1-91

**Safety**
Pyrophoricity of Metallic Titanium *(d)* 2-184
The Windscale Incident, by Tom Bishop *(aa)* ..... 1-114
The Windscale Incident (Wigner Energy Release), by T. Bishop *(c)* ..... 6-116

**Salaries**
Englishmen Underpaid? *(cp)* ..... 5-66
Salaries of Metallurgists, by Walter Morrison ..... 2-93

**Scaling**
Oxidation of 18-8 Steel at Forging Temperatures, by J. O. Edstrom *(d)* ..... 1-171

**Science Fair**
Future Scientists, by E. E. Thum *(cp)* ..... 6-65

**Scrap**
Solid Forgings from Compacted Scrap Turnings *(d)* ..... 4-176

**Semiconductors**
Bonding Soft Metals to Semiconductors *(d)* ..... 5-196

**Sheet metal**
New Method Speeds Annealing (staff report) ..... 6-97
Rolling Defects in Steel Sheet, by A. M. Armour *(d)* ..... 2-174
Smudge on Cold Rolled Sheet *(d)* ..... 5-186

**Shell cases**
Steel Cartridge Cases *(d)* ..... 5-198

**Shot blasting**
Damage by Uncontrolled Shot Blasting, by Konrad Kornfeld ..... 2-92
Damage by Uncontrolled Shot Blasting, by Konrad Kornfeld *(c)* ..... 5-114

**Sintering**
Mechanism of Sintering Aluminum Oxide *(d)* ..... 5-202

**Slags**
Hydrogen in Steel Mill Slags, by J. H. Walsh, J. Chipman, T. B. King and N. J. Grant *(d)* ..... 3-174

**Smelting, electric furnace**
Electric Smelting of Ores, by G. E. Viens, R. S. Campbell and R. R. Rogers *(d)* ..... 1-152

**Solar energy**
Batteries for Sputniks, by C. F. Reilly *(c)* ..... 2-112

**Spark plugs**
Spark Plugs and Die Castings, by E. E. Thum *(cp)* ..... 6-65

**Springs**
Selection of Steels for Springs, by H. J. Elmendorf ..... 4-80

**Sputnik**
Batteries for Sputniks, by C. F. Reilly *(c)* ..... 2-112
A Thought on Sputnik *(cp)* ..... 2-65

**Stainless steel**
Ambiguous Type Number, by Hallock C. Campbell *(c)* ..... 4-116
Brittleness in High-Manganese Stainless, by H. J. Beattie, Jr. ..... 2-114
Creep Properties of 18-8 Stainless Steel, by L. W. Larke and R. A. Whittaker *(d)* ..... 1-150
Joints and Piping for 5600-Psi. Steam, by Harry Blumberg *(d)* ..... 1-138
Low-Nickel Stainless Steel, by G. W. Hinkle *(d)* ..... 3-204
Nature of Oxides on Stainless Alloys, by John F. Radavich *(d)* ..... 2-158
Oxidation of 18-8 Steel at Forging Temperatures, by J. O. Edstrom *(d)* ..... 1-171
PH Stainless for Hot Airframes, by R. W. White ..... 6-74
Standard Stainless Steels, Wrought and Cast *(ds)* ..... 6-96-B

**Steel**
Rolling Defects in Steel Sheet, by A. M. Armour *(d)* ..... 2-174
Selection of Steels for Springs, by H. J. Elmendorf ..... 4-80
Sintered Steel From Darkest Africa *(d)* ..... 3-152

**Steel, alloy**
A High-Strength Cast Steel, by C. G. Mickelson and R. D. Engquist ..... 3-97
New Mechanism Suggested for Ingot Cracks, by P. Bjornson and H. Nathorst *(d)* ..... 2-142

**Steel, boron**
Boron in Cast Steels *(sr)* ..... 4-112
Tungsten and Titanium Steels Containing Boron, by A. Banerjee, D. K. Sood and P. Mehta *(d)* ..... 3-182

**Steel, carbon**
Chevron Patterns in Steel Fractures, by C. F. Tipper *(d)* ..... 3-145
Mild Steel in Nuclear Applications, by H. F. Beeghly *(d)* ..... 3-178
New Method Speeds Annealing (staff report) ..... 6-97

**Steel, cast**
A High-Strength Cast Steel, by C. G. Mickelson and R. D. Engquist ..... 3-97
Role of Strain Rate in Hot Cracking in Castings, by H. F. Bishop, C. G. Ackerline and W. S. Pellini *(d)* ..... 3-158

**Steel, high strength**
A High-Strength Cast Steel, by C. G. Mickelson, and R. D. Engquist ..... 3-97

**Steel industry**
Iron and Steel Needs of Argentina, by Juan B. DeNardo ..... 1-109

**Steel, manganese**
A Manganese Steel Data Book, reviewed by D. N. Rosenblatt *(br)* ..... 4-106

**Steel, titanium**
Tungsten and Titanium Steels Containing Boron, by A. Banerjee, D. K. Sood and P. Mehta *(d)* ..... 3-182

**Steel, tungsten**
Tungsten and Titanium Steels Containing Boron, by A. Banerjee, D. K. Sood and P. Mehta *(d)* ..... 3-182

**Steelmaking**
Hydrogen in Steel Mill Slags, by J. H. Walsh, J. Chipman, T. B. King and N. J. Grant *(d)* ..... 3-174
Iron and Steel Needs of Argentina, by Juan B. DeNardo ..... 1-109

**Steelmaking, electric**
Electric Furnace Refractories, by E. C. Wright ..... 5-87
Weather Influences Amount of Hydrogen in Steel, by T. W. Merrill *(d)* ..... 6-153

**Steelmaking, openhearth**
The All-Basic Openhearth (staff report) ..... 6-85

**Steelmaking, oxygen**
High-Phosphorous Pig Iron Refined With Lime and Oxygen *(d)* ..... 5-145
Lots of Oxygen at J. & L. *(cp)* ..... 2-65
Oxygen Rejuvenates the Converter Process, by E. C. Wright ..... 1-65
Rotary Oxygen Steelmaking, by Bo Kalling and Folke Johansson *(d)* ..... 1-148

**Stress-corrosion**
High-Temperature Stress-Corrosion of Titanium Alloys *(d)* ..... 6-208

**Stress-rupture**
Stress-Rupture of Heat Resistant Alloys, by J. G. Sessler and W. F. Brown, Jr. *(d)* ..... 3-128

**Surface roughness**
Effect of Surface Roughness on Fatigue Strength, by E. Siebel and M. Gaier *(d)* ..... 1-174

**Tantalum**
Uncommon Metals Ready to Solve Difficult Problems, by J. P. Denny and L. F. Kendall *(d)* ..... 6-136

**Tear test**
Hot Tearing of Magnesium Castings *(d)* ..... 5-195
Tear Test for Titanium Sheet, by C. W. Vigor and J. R. Hornaday, Jr. ..... 4-103

**Technology**
"Climate" for Crash Programs *(cp)* ..... 2-66
"Climate" for Crash Programs, by E. H. Snyder *(c)* ..... 5-114

**Television**
X-ray Inspection by TV *(d)* ..... 2-190

**Temperature measurement**
Temperature Measurement, by T. Land *(d)* ..... 2-144

**Tempering**
Metallurgy of Tempering and Annealing in Fractional Minutes, by R. K. Wuerfel ..... 4-93

**Tensile properties**
Cohesive Strength of Metals *(d)* ..... 4-180

**Thermenol**
Coming: Better Thermenol Alloys, by W. J. Buehler and C. G. Dalrymple ..... 5-78

**Thorium**
Thorium-Zirconium and Thorium-Hafnium Phase Diagrams, by E. D. Gibson, B. A. Loomis and O. N. Carlson *(d)* ..... 1-142

**Tinplate**
Some Advances in Tinplate Technology, by W. E. Hoare ..... 1-91

**Titanium**
Descaling of Titanium, by W. B. Stephenson, Jr. ..... 3-87
Forming Titanium Extrusions *(d)* ..... 5-188
High-Temperature Stress-Corrosion of Titanium Alloys *(d)* ..... 6-208
Pyrophoricity of Metallic Titanium *(d)* ..... 2-184
Tear Test for Titanium Sheet, by C. W. Vigor and J. R. Hornaday, Jr. ..... 4-103
Titanium Produced Electrolytically *(d)* ..... 5-192
Titanium Research *(d)* ..... 4-157
Titanium Rivets *(d)* ..... 4-172
What Price Titanium?, by E. E. Thum *(cp)* ..... 6-66

**Tramp elements**
Tramp Elements *(d)* ..... 1-156


***(aa)* Atomic Age; *(br)* Book Review; *(c)* Correspondence; *(cp)* Critical Points; *(d)* Digest; *(ds)* Data Sheet; *(sr)* Short Runs**

**Turbine blades**
Gas Turbine Blades for 2200° F. Service, by T. H. Blakeley and R. F. Darling *(d)* ..... 3-138

**Turbines, gas**
Gas Turbine Research in Australia, by L. P. Coombes *(d)* ..... 1-158

**Ultrasonic tests**
Removing Inclusions Ultrasonically *(d)* ..... 5-202

**Vacuum techniques**
Heat Treating in Vacuum, by Horace B. Drever ..... 3-108

**Valves**
Sideline for Valvemaker Means Lots of New Parts *(cp)* ..... 4-66

**Vanadium**
Uncommon Metals Ready to Solve Difficult Problems, by J. P. Denny and L. F. Kendall *(d)* ..... 6-136

**Waste disposal**
How to Treat Pickle Liquors in a Small Plant, by Edward W. Lang ..... 5-93

**Wear**
Corrosion and Abrasion Effect on Ferrous Metals *(d)* ..... 4-144
Induction Hardening of Bearing Surfaces, by G. W. Seulen *(d)* ..... 3-128
Surface Fatigue of Carbo-Nitrided Steel, by G. W. Powell, M. B. Bever and C. F. Floe ..... 3-67

**Welding**
Embrittlement in Welded Heat Resisting Steels, by Henry F. Tremlett *(d)* ..... 6-178
Pulse of the Nation's Welding (staff report) ..... 6-110
Wedge Welding of Unlike Metals, by Wilhelm Hoffman *(d)* ..... 2-152

**Welding, electrodes**
Coatings for Welding Electrodes, by A. C. Demos *(d)* ..... 1-184

**Welding, resistance**
A Look at High-Frequency Resistance Welding, by Wallace C. Rudd ..... 5-82

**Welding, ultrasonic**
Ultrasonic Welding—A New Technique Grows, by J. Byron Jones ..... 4-68

**Welds**
Weld Failures Overcome By Roll Plainishing, by H. L. Meredith and B. R. Russell *(d)* ..... 6-148

**X-ray diffraction**
X-Ray Studies for the Student and the Practitioner, reviewed by H. C. Stumpf and E. G. Hanes *(br)* ..... 5-111

**X-ray inspection**
X-Ray Inspection by TV *(d)* ..... 2-190

**Zirconium**
Improvement in High-Temperature Alloys by Boron and Zirconium, by W. J. Pennington ..... 3-82
Thorium-Zirconium and Thorium-Hafnium Phase Diagrams, by E. D. Gibson, B. A. Loomis and O. N. Carlson *(d)* ..... 1-142
Uncommon Metals Ready to Solve Difficult Problems, by J. P. Denny and L. F. Kendall *(d)* ..... 6-136

**Zone melting**
Zone Melting Opens New Horizons in Metallurgy ..... 4-97
Zone Purification of Metals, by Harvey S. Goering *(d)* ..... 2-178
Zone Refining of Copper *(d)* ..... 5-158

# Author Index

Ackerline, C. G. *(d)* ..... 3-158
Allard, M. *(d)* ..... 5-145
Anderson, O. L. *(d)* ..... 5-196
Andreatch, P. *(d)* ..... 5-196
Antes, H. W. *(d)* ..... 5-178
Armour, A. M. *(d)* ..... 2-174
Atkinson, Ralph H. ..... 2-97, 3-74
Ault, Neil N. *(d)* ..... 3-141

Backstrom, N. *(d)* ..... 3-180
Banerjee, A. *(d)* ..... 3-112, 3-182
Beattie, H. J., Jr. *(c)* ..... 2-114
Beeghly, H. F. *(d)* ..... 3-178
Bennett, F. C. *(d)* ..... 2-186
Bever, M. B. ..... 3-67
Bevilacqua, F. *(d)* ..... 4-196
Bishop, H. F. *(d)* ..... 3-158
Bishop, Tom ..... 1-114, *(c)* 6-116
Bjornson, P. *(d)* ..... 2-142
Blakeley, T. H. *(d)* ..... 3-138
Bleakney, H. H. *(d)* ..... 4-180
Blumberg, Harry *(d)* ..... 1-138
Boettner, Raymond C. *(c)* ..... 3-112
Boland, Lawrence F. *(d)* ..... 5-148
Botosan, Ralph A. *(sr)* ..... 4-111
Brenner, H. S. *(d)* ..... 4-172
Briggs, C. W. *(d)* ..... 4-150
Brown, W. F., Jr. *(d)* ..... 3-128
Bruland, Kenneth W. ..... 3-92
Buehler, W. J. ..... 5-78
Burdett, Philip H. *(d)* ..... 5-198
Burke, J. E. *(d)* ..... 5-202
Burkett, F. L. *(d)* ..... 2-186

Campbell, Hallock C. *(c)* ..... 4-116
Campbell, R. A. *(d)* ..... 1-152
Carlson, O. N. *(d)* ..... 1-142
Cary, P. E. ..... 3-79
Chipman, J. *(d)* ..... 3-174
Chouinard, A. F. *(d)* ..... 5-158
Christensen, H. *(d)* ..... 5-196
Cockroft, Sir John *(d)* ..... 5-110
Colwell, Donald L. ..... 1-88
Coombes, L. P. *(d)* ..... 1-158
Cotton, J. B. *(d)* ..... 3-146
Cox, F. G. *(d)* ..... 1-178
Crussard, C. *(d)* ..... 4-196
Cullen, O. E. ..... 6-67
Cullity, B. D. *(br)* ..... 5-111

Dalrymple, C. G. ..... 5-78
Darling, R. F. *(d)* ..... 3-138
David, L. *(d)* ..... 6-192
Davies, Norman H. ..... 2-79
Davis, D. J. *(d)* ..... 4-132
Davis, W. Kenneth *(d)* ..... 6-158
Dearden, J. *(d)* ..... 4-144
Demos, A. C. *(d)* ..... 1-184
DeNardo, Juan B. ..... 1-109
Denny, J. P. *(d)* ..... 6-136
Dodd, R. A. *(d)* ..... 5-196
Drever, Horace B. ..... 3-108

Ebert, L. J. *(d)* ..... 4-150
Edelman, R. E. *(d)* ..... 5-178
Edstrom, J. O. *(d)* ..... 1-170
Eisenman, William H. ..... 3-65, 5-67
Elcock, E. W. *(br)* ..... 1-104
Elmendorf, H. J. ..... 4-80
Engquist, R. D. ..... 3-97
Evans, E. B. *(d)* ..... 4-150
Everitt, Leo H. ..... 6-67

Fischer, R. B. *(c)* ..... 5-114
Floe, C. F. ..... 3-67
Foulke, D. Gardner *(d)* ..... 3-202
Fournet, Gerard *(br)* ..... 5-111
Freudenthal, A. M. *(br)* ..... 2-91

Gaier, M. *(d)* ..... 1-174
Gardner, J. F. *(d)* ..... 4-138
Gibson, E. D. *(d)* ..... 1-142
Gilbert, G. N. J. *(d)* ..... 3-140, *(d)* 6-180
Goering, Harvey S. *(d)* ..... 2-178
Gohn, George R. *(d)* ..... 2-193
Goncharov, I. N. *(d)* ..... 4-176
Graham, J. W. ..... 3-89, 4-108
Grant, N. J. *(d)* ..... 3-174
Gray, Allen G. *(cp)* ..... 4-66
Guinier, Andre *(br)* ..... 5-111
Gulbransen, Earl A. *(d)* ..... 3-148
Gulyaev, A. P. *(d)* ..... 6-180
Gunnerson, S. *(d)* ..... 1-196
Gurland, J. *(c)* ..... 6-116

Haffner, Saul *(d)* ..... 2-172
Hamilton, J. *(d)* ..... 4-190
Haney, E. G. *(br)* ..... 5-111
Harper, L. H. J. *(d)* ..... 2-180
Harwood, J. J. *(d)* ..... 3-194
Hausner, Henry H. ..... 1-106
Hegarty, A. *(d)* ..... 3-192
Heine, Hans J. *(br)* ..... 6-113
Heiskanen, S. *(d)* ..... 3-180
Henry, G. *(d)* ..... 4-195
Herring, W. E. ..... 3-79
Hess, Frederic O. ..... 6-99
Hickey, Philips J. *(d)* ..... 4-188
Hillberry, Norman *(c)* ..... 6-122
Hinchcliffe, M. R. *(d)* ..... 4-138
Hinkle, G. W. *(d)* ..... 3-204
Hinton, Christopher *(d)* ..... 4-179
Hoare, W. E. ..... 1-91
Hoffman, Wilhelm *(d)* ..... 2-152
Hornaday, J. R., Jr. ..... 4-105
Hull, Lawrence J. ..... 2-68
Hunter, R. J. E. *(d)* ..... 5-130

Ilme, U. *(d)* ..... 3-180
Ipsen, Harold N. ..... 5-89

Jacquet, Pierre A. *(c)* ..... 4-114
Johansson, Folke *(d)* ..... 1-148
Jones, J. Byron ..... 4-68
Jones, W. D. *(c)* ..... 4-114
Joseph, Carl F. ..... 5-104

Kalling, Bo *(d)* ..... 1-148
Kehl, George L. *(d)* ..... 5-202
Kendall L. F. *(d)* ..... 6-136
Keshian, Henry G. *(c)* ..... 6-122
Kessler, H. D. *(d)* ..... 4-157
King, T. B. *(d)* ..... 3-174
Koebel, Norbert K. ..... 2-72
Kopituk, R. C. ..... 6-79
Kornfeld, Konrad ..... 2-92, *(c)* 5-114
Krainer, H. *(d)* ..... 2-192
Kramarov, A. D. *(d)* ..... 5-172
Kramer, Andrew W. ..... 1-76
Kuzmick, Jerome ..... 3-92

Land, T. *(d)* ..... 2-144
Landa, A. F. *(d)* ..... 6-152
Lang, Edward W. ..... 5-93
Lansing, James H. ..... 5-102
Larke, L. W. *(d)* ..... 1-150
Loomis, B. A. *(d)* ..... 1-142

Magnus, E. O. ..... 3-79
Malininas, K. A. *(d)* ..... 5-180
Manly, W. D. *(d)* ..... 3-132
Matz, Michael A. *(d)* ..... 5-186
McGlothlin, Gilbert *(d)* ..... 5-126
McGonnagle, Warren J. *(d)* 5-202
McQuaid, Harry W. *(d)* ..... 3-208
Mehta, P. *(d)* ..... 3-182
Meier, J. W. *(d)* ..... 5-195
Meredith, H. L. *(d)* ..... 6-148
Merrill, T. W. *(d)* ..... 6-153
Mickelson, C. G. ..... 3-97
Mitsche, Roland ..... 1-97
Moeller, R. W. *(d)* ..... 1-182
Morgan, Eric R. ..... 6-88
Morrison, Walter ..... 2-93
Morse, Philip W. ..... 2-79
Mulcahy, Bertram A. *(c)* ..... 6-120

Nathorst, H. *(d)* ..... 2-142
Newkirk, J. B. *(br)* ..... 1-104
Nijhawan, B. R. ..... 1-112

Owens, R. K. *(d)* ..... 5-178

Palmer, K. B. *(d)* ..... 3-140
Patterson, Wilhelm *(d)* ..... 3-198
Pearlstein, F. *(d)* ..... 3-188
Pellini, W. S. *(d)* ..... 3-158
Pennington, W. J. ..... 3-82
Petrichenko, A. M. *(d)* ..... 1-198
Pettibone, Robert L. *(d)* ..... 204
Plateau, J. *(d)* ..... 4-195
Pollard, W. A. *(d)* ..... 5-195
Powell, G. W. ..... 3-67

Radavich, John F., *(d)* ..... 2-158
Rademacher, Leo *(d)* ..... 4-156
Reed, Richard J. ..... 2-79
Reilly, C. F., *(c)* ..... 2-112
Riebensahm, P. *(c)* ..... 4-116
Roast, Harold J. *(b)* ..... 2-194
Robins, D. A. *(d)* ..... 5-158
Roddis, Louis H., Jr. *(d)* ..... 6-158

Rogers, R. R. *(d)* ..... 1-152
Rose, Adolph *(d)* ..... 4-156
Rosenblatt, D. N. *(br)* ..... 4-106
Roth, H. P. ..... 3-70
Rudd, Wallace C. ..... 5-82
Russell, B. R. *(d)* ..... 6-148
Rutherford, John J. B. ..... 2-106

Schaefer, A. O. *(d)* ..... 2-140
Schapiro, Leo *(br)* ..... 2-91
Schoefer, E. A. ..... 6-106
Semchenko, E. P. *(d)* ..... 4-176
Sessler, J. G. *(d)* ..... 3-128
Seulen, G. W. *(d)* ..... 3-128
Siebel, E. *(d)* ..... 1-174
Sinha, H. N. *(d)* ..... 5-192
Sisco, Anneliese Grunhaldt *(br)* 3-110
Smith, Walter C. *(d)* ..... 4-188
Snell, W. A. *(d)* ..... 1-182
Snyder, E. H. *(c)* ..... 5-114
Sood, D. K. *(d)* ..... 3-182
Steinmetz, Hyman *(d)* ..... 5-202
Stephenson, W. B., Jr. ..... 3-87
Stumpf, H. C. *(br)* ..... 5-111
Sutton, Hubert ..... 1-102
Swindale, J. D. *(d)* ..... 4-144

Tardif, H. P. *(c)* ..... 4-116
Thomson, R. F. ..... 3-99
Thum, E. E. ..... *(cp)* 4-67, *(cp)* 5-66, *(cp)* 6-113
Tipper, C. F. *(d)* ..... 3-145
Tolmie, E. D. *(d)* ..... 5-168
Tolstoguzov, N. V. *(d)* ..... 5-172
Towner, R. J. ..... 5-70
Tremlett, Henry F. *(d)* ..... 6-178
Trentini, B. *(d)* ..... 5-145
Turner, H. S. ..... 5-109

Vanderwilt, John W. *(c)* ..... 6-118
Viens, G. E. *(d)* ..... 1-152
Vigor, C. W. ..... 4-103

Wade, J. B. *(d)* ..... 1-138
Wallhausen, C. W. *(d)* ..... 6-202
Walsh, J. H. *(d)* ..... 3-174
Walton, Charles F. *(br)* ..... 6-118
Watkins, R. J. *(d)* ..... 3-146
Welsh, N. C. *(d)* ..... 6-186
Weymueller, Carl R. *(cp)* 2-65 *(cp)* ..... 4-65
White, H. S. *(d)* ..... 6-194
White, R. W. ..... 6-74
Whittaker, R. A. *(d)* ..... 1-150
Wikle, K. G. ..... 4-85
Wilms, G. R. *(d)* ..... 1-138
Wilson, I. J. *(d)* ..... 5-188
Wittmoser, Adalbert ..... 1-83
Worner, H. K. *(d)* ..... 5-192
Wright, E. C. ..... 1-65, 5-87
Wuerfel, R. K. ..... 4-93

Yakhnina, V. D. *(d)* ..... 6-152

Zimmerman, W. F. ..... 3-89, 4-108

***(aa)*** **Atomic Age;** ***(br)*** **Book Review;** ***(c)*** **Correspondence;** ***(cp)*** **Critical Points;** ***(d)*** **Digest;** ***(ds)*** **Data Sheet;** ***(sr)*** **Short Runs**

# Metal Progress

Volume 74

July 1958 through December 1958

ERNEST E. THUM, *Editor-in Chief*
ALLEN G. GRAY, *Editor*
MARJORIE R. HYSLOP, *Managing Editor*
*Assistant Editors*
DAVE RITCHIE
CARL R. WEYMUELLER
FLOYD E. CRAIG, *Art Director*
ELIZABETH MCCALL ALDRICH, *Editorial Assistant*

*Metal Progress Is Owned and Published by*
THE AMERICAN SOCIETY FOR METALS
7301 Euclid Avenue, Cleveland 3, Ohio

# Subject Index

**The subject headings used in this index are chosen in accordance with the ASM-SLA Metallurgical Literature Classification, International (Revised) Edition, published by the American Society for Metals, 1958.**


**Adam**
Adam the First Ironworker (?) *(c)* ..... 6-120

**Adherence**
Testing Adhesive Strength of Metallic Coatings, by E. A. Franks *(d)* ..... 6-154

**Adhesive joining**
Adhesive Bonding of Metals, by A. E. Williams *(d)* ..... 2-154

**Aging**
Aging Characteristics of Hastelloy B, by R. E. Clausing, P. Patriarca and W. D. Manly *(d)* ..... 4-256

**Aircraft**
Metallurgy in the Space Age *(d)* ..... 6-173
Preview of Space Metals, Staff Report ..... 4-96
What the Aircraft Maker Wants in a Steel Casting, by L. H. McCreery ..... 1-71

**Aluminum**
Bridges by the Dozen *(cp)* ..... 5-66
Casting Aluminum Ingots Under Water, by Ichiji Obinata and Hiroshi Tanaka *(d)* ..... 4-174
Chlorine Improves Aluminum Weld, by M. R. Kasen and A. R. Pfluger *(d)* ..... 3-145
Heat Treating Affects Aluminum Extrusions, by J. K. McLaughlin ..... 1-105
Overheating Effects in Aluminum Alloys, by T. R. G. Williams *(d)* ..... 1-182
Preview of Space Metals — Aluminum and Magnesium, Staff Report ..... 4-98
Recrystallized Surfaces of Aluminum Extrusions, by Kirby F. Thornton *(c)* ..... 2-126
Strain Hardening in Aluminum, by D. S. Fields, Jr., and W. A. Backofen *(d)* ..... 4-216
What's New in Everyday Uses for Metals — Aluminum . . . Wrought Alloys, by J. A. Nock, Jr. and F. Keller ..... 4-114

**Atomic bombs**
Hazards From Fall-Out *(aa)* ..... 5-92
Hazards From Fall-Out, by Austin M. Brues *(c)* ..... 5-120

**Atomic energy**
Atomic Energy for Space Propulsion *(aa)* ..... 6-80

**Atomic power**
An English Turbogenerator Explodes, by Tom Bishop ..... 6-114
Euratom *(aa)* ..... 3-98

**Austempering**
Mechanized Austempering of Steel Harrow Disks, Staff Report ..... 3-78

**Austenite decomposition**
Cooling Transformation Diagrams for A.I.S.I. 4024 and 52100, by R. C. Hess and D. J. Blickwede *(ds)* ..... 1-96B
Cooling Transformation Diagrams for A.I.S.I. 4815 and 43 BV 14, by R. C. Hess and E. Kozic *(ds)* ..... 5-96B
Hardening Steel, by D. J. Schmatz and V. F. Zackay *(d)* ..... 5-180
Measuring Austenite Transformation, by R. A. Grange, P. T. Kilhefner, Jr., and T. P. Bittner *(d)* ..... 4-198

**Automobiles**
Detroit Revisited — Appraisal of Recent Metallurgical Advances in American Automobile Manufacturing, by J. L. McCloud ..... 4-130

**Babbitt**
Babbitting Bearings by Centrifugal Force, by W. B. Keyser ..... 5-90
Swedes Make Modern Bearings, by A. E. Olsson ..... 2-91

**Bands (deformation structure)**
Mechanism of Banding, by Paul G. Bastien *(d)* ..... 4-288

**Bearings**
Babbitting Bearings by Centrifugal Force, by W. B. Keyser ..... 5-90
No Waiting in This Heat Treat Line, by Leo N. Everitt and Clarke Sykes ..... 6-74
Swedes Make Modern Bearings, by A. E. Olsson ..... 2-91

**Beryllium**
Preview of Space Metals — Beryllium, Staff Report ..... 4-104

**Biographies**
Biographical Appreciation — James Tucker MacKenzie ..... 6-82
A Prominent American Metallurgist — William Alvin Mudge, by Myron Weiss ..... 1-86

**Blast furnace**
How to Make More Steel, Staff Report ..... 5-97
Modern Attacks on Iron Ores, by C. F. Hoffman ..... 3-67
Sintering: 5000 Tons a Day, Staff Report ..... 3-74
Two New Sintering Plants, by Richard W. Adams and K. S. Loofboro *(d)* ..... 5-136

**Blast furnace, low shaft**
Low-Shaft Blast Furnace, by F. W. Starratt *(d)* ..... 2-180

**Bonded metals**
Preview of Space Metals — Composite Materials, Staff Report ..... 4-109

**Brain**
Behind the Brain: a Brain *(cp)* ..... 5-66

**Brazing**
Brazing Alloys for Guided Missiles, by A. T. Cape ..... 3-99
Joining Problems Aired, Reported by J. L. McCloud ..... 1-93

**Bridges**
Bridges by the Dozen *(cp)* ..... 5-66

**Brittleness**
Another Turbogenerator Failure, by R. James Landrum ..... 3-91
Brittle Fracture of Titanium, by R. I. Jaffee and D. N. Williams *(d)* ..... 4-244
Brittle Fracture Propagation, by J. M. Barry *(d)* ..... 4-228
Ductile to Brittle Transition of 1020 Steel, by F. S. Deronja and M. Gensamer *(d)* ..... 4-214
Ductility of Austenitic Stainless Alloys, by F. W. Schaller and V. F. Zackay *(d)* ..... 4-226
Hydrogen-Induced Delayed Failure in Titanium, by R. D. Daniels, R. J. Quigg and A. R. Troiano *(d)* ..... 1-268
Hydrogen Tolerance of Titanium Alloys, by D. N. Williams, F. R. Schwartzberg and R. I. Jaffee *(d)* ..... 4-244

**Bronze**
Degassing Bronze Castings With Nitrogen, by P. K. Chakravarty and S. Visvanathan *(d)* ..... 5-182

**Carbides**
Carbide Phases Produced in High-Carbon Steel, by Morris Mentser *(d)* ..... 4-262

**Carburizing**
Minimizing Distortion, by F. P. Heard *(c)* ..... 6-120
No Waiting in This Heat Treat Line, by Leo N. Everitt and Clarke Sykes ..... 6-74
Potential of Higher Temperature Carburizing, Staff Report ..... 4-134

**Cast iron**
Titanium in Nodular Cast Iron, by A. Tominaga, I. Aoki and T. Tottori *(sr)* ..... 2-116
What's New in Everyday Uses for Metals — Ferrous Castings, by Thomas E. Eagan ..... 4-118

**Cast iron, nodular**
Nodular Iron Welding Rod Containing Cerium, by R. O. Day, J. S. Snyder and H. V. Inskeep *(d)* ..... 6-182
Titanium in Cast Iron, by P. E. Hegmegee, Jr. *(c)* ..... 6-122

**Casting**
Casting Aluminum Ingots Under Water, by Ichiji Obinata and Hiroshi Tanaka *(d)* ..... 4-174

**Casting, centrifugal**
Babbitting Bearings by Centrifugal Force, by W. B. Keyser ..... 5-90

**Casting, continuous**
Continuous Casting of Steel, by Josef Hofmaier *(d)* ..... 2-174

**Castings**
Corrosion and Heat Resistant High-Alloy Castings *(ds)* ..... 6-96B
Degassing Bronze Castings With Nitrogen, by P. K. Chakravarty and S. Visvanathan *(d)* ..... 5-182
High Alloy Castings . . . Selection of Alloys for Corrosion Resistant Service, by W. T. Bryan ..... 6-102
High Alloy Castings . . . Selection of Alloys for Heat Resistant Service, by R. A. Miller ..... 6-98
High Alloy Castings . . . Specifications and Properties, by Ernest A. Schoefer 6-95
Nondestructive Tests for Nonferrous Castings, by S. L. Fry *(d)* ..... 5-156
Quality Control of Nonferrous Castings *(d)* ..... 5-144
What's New in Everyday Uses for Metals — Nonferrous Castings, by D. L. Colwell ..... 4-127

**Ceramic coatings**
Where Do We Stand in Ceramic Coatings? by N. I. Cannistraro ..... 5-111

**Ceramics**
Preview of Space Metals — Ceramics and Cermets, Staff Report ..... 4-108


***(aa)* Atomic Age; *(br)* Book Review; *(c)* Correspondence; *(cp)* Critical Points; *(d)* Digest; *(ds)* Data Sheet; *(sr)* Short Runs**

**Cerium**
Etchant for Cerium and Cerium Alloys, by Donald T. Klodt and Robert J. McManis *(c)* ....6-120
Nodular Iron Welding Rod Containing Cerium, by R. O. Day, J. S. Snyder and H. V. Inskeep *(d)*....6-182

**Cermets**
Preview of Space Metals — Ceramics and Cermets, Staff Report ....4-108

**Cleaning, salt-bath**
How to Avoid Hydrogen Pickup in Descaling Titanium Alloys, by Q. D. Wheatley ....6-112
Swedes Make Modern Bearings, by A. E. Olsson .... 2-91

**Coating**
Preview of Space Metals — Coatings and Surface Treatment, Staff Report 4-111

**Coatings**
Testing Adhesive Strength of Metallic Coatings, by E. A. Franks *(d)*....6-154

**Cobalt**
Vacuum Melted Alloys *(ds)* ....2-96B

**Columbium**
Binary Columbium Alloys, by Chester T. Sims, William D. Klopp and Robert I. Jaffee *(d)* ....4-230
Columbium at Elevated Temperatures, by W. D. Klopp, C. T. Sims and R. I. Jaffee *(d)* ....4-210
Welding the Refractory Metals, by L. F. Yntema ....3-105

**Composite materials**
Preview of Space Metals — Composite Materials, Staff Report ....4-109

**Controlled atmospheres**
Getting the Most from a Drying System, by James E. Greever .... 1-83

**Copper**
Foil Clad Laminates in Printed Circuitry, by D. K. Rider .... 3-81
What's New in Everyday Uses for Metals — Copper . . . Wrought Alloys, by Arthur I. Heim ....4-123

**Corrosion**
Titanium in Fuming Nitric Acid Environment, by John B. Rittenhouse *(d)* ....4-220

**Corrosion resisting alloys**
Corrosion and Heat Resistant High-Alloy Castings *(ds)* ....6-96B
High Alloy Castings . . . Selection of Alloys for Corrosion Resistant Service, by W. T. Bryan ....6-102

**Corrosion tests**
Corrosion Testing of Metals, by J. H. Hooper *(d)* ....1-142
Measuring Intergranular Corrosion Electrically, by R. C. Robinson *(d)*....5-160

**Creep**
Accelerated Creep-Rupture Testing, by S. S. Manson, G. S. Succop and W. F. Brown, Jr. *(d)* ....4-208
Negative Creep in Alloys, by R. W. Fountain and M. Korchynsky *(d)* ....4-252

**Crystal structure**
Problems of the Dislocation Specialist, reviewed by Paul A. Flinn *(br)* ....2-115
Tables of Crystal Structures, reviewed by Charles S. Barrett *(br)* .... 5-95

**DCM alloy**
Two New 1800°F. Alloys for Cast Turbine Blades — DCM Alloy, by J. E. Wilson ....5-83

**Degassing**
Degassing Bronze Castings with Nitrogen, by P. K. Chakravarty and S. Visvanathan *(d)* ....5-182
Vacuum Degassing, by John N. Hornak and M. A. Orehoski *(d)*....2-142
Vacuum Degassing at Bethlehem, by J. H. Stoll *(d)* ....2-146

**Design**
Behind the Brain: a Brain *(cp)* ....5-66
Design Allowables in Weldments *(cp)*.... 6-66

**Die casting**
Die Steels for Pressure Die Castings, by K. I. Bengtsson *(d)* ....1-176

**Dies**
Die Steels for Pressure Die Castings, by K. I. Bengtsson *(d)* ....1-176

**Direct reduction**
A New Direct Reduction Method, by M. J. Udy and M. C. Udy .... 6-92
Modern Attacks on Iron Ores, by C. F. Hoffman .... 3-67

**Discaloy**
Production of Discaloy by Vacuum Arc Melting, by D. R. Carnahan ....2-100

**Dislocations**
Problems of the Dislocation Specialist, review by Paul A. Flinn *(br)* ....2-115

**Distortion**
Minimizing Distortion, by F. P. Heard *(c)* ....6-120

**Drawing, deep**
Evaluating Deep Drawing Qualities of Sheet Metals, by O. H. Kemmis *(d)*....4-270
Improved Methods of Deep Drawing, by our Special Correspondent.... 2-84

**Education**
Many Metallurgists Still Needed ....3-80A
Recent Statistics on Metallurgical Education, by W. O. Philbrook ....3-113

**Electron beam furnace**
Ultra-Pure Metals Produced in Electron Beam Furnace, by T. C. DuMond 6-84

**Electronic equipment**
Behind the Brain: a Brain *(cp)* .... 5-66

**Electroplating**
Disposal Plant for New Plating Facility, by G. J. O'Kane *(d)* ....1-178
Fresh Look at Plating Problems, Staff Report ....1-112

**Etching**
Etchant for Cerium and Cerium Alloys, by Donald T. Klodt and Robert J. McManis *(c)* ....6-120

**Explosive forming**
Forming Metals at High Velocities, by T. C. DuMond .... 5-68

**Extrusions**
Heat Treating Affects Aluminum Extrusions, by J. K. McLaughlin ....1-105
Recrystallized Surfaces of Aluminum Extrusions, by Kirby F. Thornton *(c)* ....2-126

**Fatigue**
Another Turbogenerator Failure, by R. James Landrum .... 3-91
Fatigue Failures in Hydraulic Tubing, by John O. Almen *(c)* ....5-118
How to Make Hydraulic Tubing Last Longer, by C. S. Yen and J. L. Waisman .... 1-88
Inclusions: Nuclei for Fatigue Cracks? Staff Report ....2-120
Stress-Raisers in Engineering Parts, by G. A. Cottell *(d)*....3-158
Thermal and Load-Cycling Fatigue Tests, by Harry Majors, Jr. *(d)* ....4-184

**Flame cutting**
Oxygen-Sand Flame Cutting of Stainless Steels, by G. A. Ukolov, V. N. Chernov and N. N. Korf *(d)* ....5-184

**Flaw detection**
Fluoroscopy Is Ready for New Jobs, by W. R. Hampe *(d)* ....1-130
Nondestructive Tests for Nonferrous Castings, by S. L. Fry *(d)* ....5-156

**Fluoroscopy**
Fluoroscopy Is Ready for New Jobs, by W. R. Hampe *(d)* ....1-130

**Foil**
Foil Clad Laminates in Printed Circuitry, by D. K. Rider .... 3-81

**Forging**
Automatic Press for Small Forgings *(sr)* ....5-116
Forging Blooms From Ingots, by John E. Decker .... 3-71
Forging Titanium Alloys, by L. S. Croan and F. J. Rizzitano *(d)* ....4-188

**Forgings**
An English Turbogenerator Explodes, by Tom Bishop ....6-114
Another Turbogenerator Failure, by R. James Landrum .... 3-91
Homogeneous Steel *(ep)*.... 6-63

**Fractography**
A Magnetic Specimen Mount for Fractography, by D. B. Ballard and J. A. Bennett *(sr)* ....5-114

**Furnaces, heat treating**
Quenching Titanium Under Inert Atmosphere, by E. C. Buckingham *(sr)*..5-115
Vacuum Furnace for 3000°F. *(sr)*....2-116

**Gears**
Case History on Hardening Large Drive Gear, by Victor H. Pagano and Charles J. Kropf ....3-86

**Graphite**
Preview of Space Metals — Graphite, Staff Report ....4-109

**Hafnium**
A Lesson in Fabricating Nuclear Parts, Staff Report .... 2-68
Calcium Reduction of Zirconium, by O. N. Carlson, F. A. Schmidt and H. A. Wilhelm *(d)* ....3-194

**Hammers**
Producing Martensite by Impact, by H. O. McIntire and G. K. Manning .... 5-94

**Hard surfacing**
Abrasion Resistance of Weld Deposits, by E. I. Leynachuk *(d)* ....2-150

**Hardening**
Case History on Hardening Large Drive Gear, by Victor H. Pagano and Charles J. Kropf .... 3-86
Hardening Steel, by D. J. Schmatz and V. F. Zackay *(d)* ....5-180

**Hardness**
Tempered Alloy Martensites, by Peter Payson *(d)* ....6-138

**Hardness conversions**
Hardness Conversions, Knoop Versus Vickers, by Lloyd Emond *(ds)*....3-96B
Vickers-Knoop Hardness Conversions, by Lloyd Emond .... 3-97

**Heat exchangers**
Resistance Welded Tube Joints in Heat Exchangers, by J. J. Mueller ....6-106

**Heat resisting alloys**
A User Looks at Cleanliness of Vacuum-Melted Alloys, by Donald E. Nulk ....2-103
Corrosion and Heat Resistant High-Alloy Castings *(ds)* ....6-96B
High Alloy Castings . . . Selection of Alloys for Heat Resistant Service, by R. A. Miller .... 6-98
High Alloy Castings . . . Specifications and Properties, by Ernest A. Schoefer 6-95
High-Temperature Metallurgy Today, by L. P. Jahnke and R. G. Frank ....5-77; 6-86
Metal Problems Considered at A.S.T.M. Meeting, Staff Report ....2-118
Molybdenum Is Here to Stay, by J. L. McCloud .... 2-75
Preview of Space Metals — Refractory Metals, Staff Report ....4-107
Preview of Space Metals — Superalloys, Staff Report ....4-106
Production of Discaloy by Vacuum Arc Melting, by D. R. Carnahan....2-100
Two New 1800°F. Alloys for Cast Turbine Blades — DCM Alloy, by J. E. Wilson .... 5-83
Two New 1800°F. Alloys for Cast Turbine Blades — Nicrotung, by J. T. Brown .... 5-83
W-545 . . . A Better Turbine Disk Alloy, by J. T. Brown .... 2-87

**Heat treatment**
Heat Treating Rocket Cases *(ep)* .... 3-65
Heat Treatment of Ti for Stress Stability at High Temperature, by M. L. Greenlee, G. A. Lenning, W. M. Parris and H. D. Kessler *(d)* ....4-248
Rate Process Theory for Heat Treatment of Titanium, by N. M. Erkun *(d)* ....4-240
Temperature Uniformity, by W. F. Ross *(c)* ....3-116
Temperature Uniformity, by Cary H. Stevenson *(c)* ....2-128

**High-temperature properties**
High-Temperature Metallurgy Today, by L. P. Jahnke and R. G. Frank ....5-77; 6-86
Metals at Elevated Temperatures, by N. P. Allen *(d)*....4-284


***(aa)* Atomic Age; *(br)* Book Review; *(c)* Correspondence; *(cp)* Critical Points; *(d)* Digest; *(ds)* Data Sheet; *(sr)* Short Runs**

**Impact test**
Notched-Bar Test, by J. A. Hendrickson, D. S. Wood and D. S. Clark *(d)* 4-250

**Inclusions**
A User Looks at Cleanliness of Vacuum-Melted Alloys, by Donald E. Nulk 2-103
Identification of Uranium Inclusions, by G. L. Kehl, Eric Mendel, E. Milio Jaraiz and M. H. Mueller *(d)* 4-256
Inclusions: Nuclei for Fatigue Cracks? Staff Report 2-120

**Induction heat**
Case History on Hardening Large Drive Gear, by Victor H. Pagano and Charles J. Kropf 3-86

**Information center**
Forecast of an Information Center, by Marjorie R. Hyslop 1-108

**Ingot casting**
Homogeneous Steel *(cp)* 6-63
Quality Control in Specialty Steel Production, by J. S. Pendleton, Jr., and H. O. Beaver, Jr. 5-100
Pouring of Uniform Ingots, by W. A. Black *(d)* 2-152

**Ingots**
Forging Blooms From Ingots, by John E. Decker 3-71

**Iron**
What Carbon and Alloys Do for Iron Powder, by S. R. Crooks 6-68

**Iron-aluminum-silicon alloys**
Mechanical Properties of Fe-Al-Si Alloys, by D. J. Schmatz and V. F. Zackay *(d)* 4-264

**Iron-nickel-chromium alloys**
Precipitation Hardening of an Iron-Base Alloy, by T. W. Eichelberger *(d)* 4-266

**Iron ore**
A New Direct Reduction Method, by M. J. Udy and M. C. Udy 6-92

**Light metallurgy**
Preposition Using by Metallurgists, by Bruce A. Rogers 5-108

**Literature techniques**
Forecast of an Information Center, by Marjorie R. Hyslop 1-108

**Low-temperature properties**
Ductile to Brittle Transition of 1020 Steel, by F. S. Deronja and M. Gensamer *(d)* 4-214
Low-Temperature Toughness of Welds for Storage Tanks, by B. F. Lebedev *(d)* 6-184

**Machining**
Behind the Brain: a Brain *(cp)* 5-66

**Magnesium**
Magnox — Corrosion Resistant Magnesium, by W. H. Zinn *(d)* 6-156
Preview of Space Metals — Aluminum and Magnesium, Staff Report 4-98
Unique Deformation of Magnesium Alloys, by S. L. Couling, J. P. Pashak and L. Sturkey *(d)* 4-202
Weld Cracking in Magnesium Alloys, by C. L. Kobrin and R. A. Dodd *(d)* 4-197
What's New in Everyday Uses for Metals — Magnesium, by C. E. Nelson 4-125

**Martensite**
Producing Martensite by Impact, by H. O. McIntire and G. K. Manning 5-94
Tempered Alloy Martensites, by Peter Payson *(d)* 6-138

**Materials**
Study of Engineering Materials, reviewed by Donald S. Clark *(br)* 1-110

**Metallography**
Better Metallographic Techniques . . . Metallography of Disturbed Uranium Surfaces, by H. P. Roth and R. B. Russell 4-140
Better Metallographic Techniques . . . Polishing by Vibration, by E. L. Long and R. J. Gray 4-145
Better Metallographic Techniques . . . Polishing Hard Metals Electromagnetically, by J. M. Dickinson 4-142

**Metallurgy**
A Two-Volume Introduction to Physical and Process Metallurgy, reviewed by John A. Shandley and Walter J. Kinderman *(br)* 6-116

**Microscopy**
Labeling Micrographs and Photographs, by H. Peter Hirschler and Vincent O. Lagerberg *(a)* 3-116
Preparation of Arc-Melted Uranium Carbides, by R. J. Gray, W. C. Thurber and C. K. H. DuBose 1-65

**Missiles**
Brazing Alloys for Guided Missiles, by A. T. Cape 3-99
Missile Testing *(cp)* 6-65
Preview of Space Metals, Staff Report 4-96

**Molybdenum**
Molybdenum Is Here to Stay, by J. L. McCloud 2-75
Welding the Refractory Metals, by L. F. Yntema 3-105

**National Metal Congress**
Come to Cleveland . . . by G. M. Young 4-65
40th National Metal Congress, complete programs 4-66
Exhibitor Listing 4-89

**Neutrino**
"I Got Plenty of Nothin'" *(cp)* 5-67

**Nickel**
Aging Characteristics of Hastelloy B, by R. E. Clausing, P. Patriarca and W. D. Manly *(d)* 4-256
Thermal and Load-Cycling Fatigue Tests, by Harry Majors, Jr. *(d)* 4-184
Vacuum Melted Alloys *(ds)* 2-96B
Welding Nickel and Nickel Alloys, by George R. Pease *(d)* 4-274

**Nickel alloys**
Rolling Sheet in Kokomo *(cp)* 6-67

**Nicrotung**
Two New 1800°F. Alloys for Cast Turbine Blades — Nicrotung, by J. T. Brown 5-83

**Nitrogen**
Nitrogen in Stainless Steels *(d)* 1-136

**Nonferrous metals**
Nondestructive Tests for Nonferrous Castings, by S. L. Fry *(d)* 5-156
Quality Control of Nonferrous Castings *(d)* 5-144
What's New in Everyday Uses for Metals — Nonferrous Castings, by D. L. Colwell 4-127

**Nuclear reactor components**
A Lesson in Fabricating Nuclear Parts, Staff Report 2-68
Powder Metallurgy of Refractory Metals, by Alan Blainey 3-95

**Nuclear reactors**
Theory versus Practice *(cp)* 2-66

**Plastic deformation**
Mechanism of Banding, by Paul G. Bastien *(d)* 4-288

**Polishing, metallographic**
Better Metallographic Techniques . . . Polishing by Vibration, by E. L. Long and R. J. Gray 4-145
Better Metallographic Techniques . . . Polishing Hard Metals Electromagnetically, by J. M. Dickinson 4-142
Mechanically Polished Surfaces, by L. E. Samuels and G. R. Wallwork *(d)* 4-278

**Pouring**
Nozzle Sizes for Rimmed Steel, by A. T. Peters *(d)* 2-160
Pouring of Uniform Ingots, by W. A. Black *(d)* 2-152

**Powder metallurgy**
Getting More From Metal Powders, Staff Report 1-101
Powder Metallurgy of Refractory Metals, by Alan Blainey 3-95
Powder Metallurgy of Uranium and Thorium, by Alan Blainey 2-79
Preparing Uranium Powder Metal Compacts, by Herbert S. Kalish *(d)* 4-176
Rolling Metal Powder Into Strip, by Richard A. Smucker *(d)* 5-142
What Carbon and Alloys Do for Iron Powder by S. R. Crooks 6-68

**Precipitation hardening**
Precipitation Hardening of an Iron-Base Alloy, by T. W. Eichelberger *(d)* 4-266

**Presses**
Automatic Press for Small Forgings *(sr)* 5-116

**Printed circuits**
Foil Clad Laminates in Printed Circuitry, by D. K. Rider 3-81

**Pure metals**
Ultra-Pure Metals Produced in Electron Beam Furnace, by T. C. DuMond 6-84

**Recrystallization**
Recrystallized Surfaces of Aluminum Extrusions, by Kirby F. Thornton *(c)* 2-126

**Refractories**
Basic Electric Furnace Refractories, by A. H. Thomson *(d)* 5-174
Castable and Plastic Refractories, by G. D. Cobaugh and C. R. Hauth *(d)* 5-138

**Refractory metals**
Powder Metallurgy of Refractory Metals, by Alan Blainey 3-95
Preview of Space Metals — Refractory Metals, Staff Report 4-107
Welding the Refractory Metals, by L. F. Yntema 3-105

**Research**
IRSID Opens Pilot-Plant Laboratories, by Our European Consulting Editor 2-123

**Resources**
Metal Problems Considered at A.S.T.M. Meeting, Staff Report 2-118

**Rockets**
Heat Treating Rocket Cases *(cp)* 3-65

**Rolling**
Developments in Hot Strip Mills, by R. W. Barnitz and H. H. Shakely *(d)* 5-140
How to Make More Steel, Staff Report 5-97
Rolling Metal Powder Into Strip, by Richard A. Smucker *(d)* 5-142
Rolling Sheet in Kokomo *(cp)* 6-67

**Safety**
An English Turbogenerator Explodes, by Tom Bishop 6-114
Hazards From Fall-Out *(aa)* 5-92
Hazards From Fall-Out, by Austin M. Brues *(c)* 5-120
Producing Martensite by Impact, by H. O. McIntire and G. K. Manning 5-94

**Salt baths**
How to Avoid Hydrogen Pickup in Descaling Titanium Alloys, by Q. D. Wheatley 6-112

**Sandwich structure**
Preview of Space Metals — Sandwich Structures, Staff Report 4-110

**Scientists**
Are Scientists People? *(cp)* 2-65

**Segregation**
Quality Control in Specialty Steel Production, by J. S. Pendleton, Jr., and H. O. Beaver, Jr. 5-100

**Sheet metal**
Evaluating Deep Drawing Qualities of Sheet Metals, by O. H. Kemmis *(d)* 4-270
Improved Methods of Deep Drawing, by Our Special Correspondent 2-84
Strain Aging of Steel Sheet, by E. R. Morgan *(d)* 6-157

**Sintering**
Sintering: 5000 Tons a Day, Staff Report 3-74
Two New Sintering Plants, by Richard W. Adams and K. S. Loofboro *(d)* 5-136

**Solidification**
Quality Control in Specialty Steel Production, by J. S. Pendleton, Jr., and H. O. Beaver, Jr. 5-100

**Spacecraft**
Atomic Energy for Space Propulsion *(aa)* 6-80
Introduction to Outer Space 1-76
Materials for a Space Traveler, by Rodney A. Jones 1-78
Metallurgy in the Space Age *(d)* 6-173
Preview of Space Metals, Staff Report 4-96
Sputnik X, by H. K. Lloyd *(c)* 2-128

**Specifications**
A.I.S.I. Standard Alloy Steel Composition *(ds)* 4-120B


***(aa)* Atomic Age; *(br)* Book Review; *(c)* Correspondence; *(cp)* Critical Points; *(d)* Digest; *(ds)* Data Sheet; *(sr)* Short Runs**

**Specimen preparation**
A Magnetic Specimen Mount for Fractography, by D. B. Ballard and J. A. Bennett *(sr)* ..... 5-114

**Stainless steel**
Corrosion and Heat Resistant High-Alloy Castings *(ds)* ..... 6-96B
Ductility of Austenitic Stainless Alloys, by F. W. Schaller and V. F. Zackay *(d)* ..... 4-226
High Alloy Castings . . . Selection of Alloys for Corrosion Resistant Service, by W. T. Bryan ..... 6-102
High Alloy Castings . . . Selection of Alloys for Heat Resistant Service, by R. A. Miller ..... 6-98
High Alloy Castings . . . Specifications and Properties, by Ernest A. Schoefer 6-95
Mechanically Polished Surfaces, by L. E. Samuels and G. R. Wallwork *(d)* ..... 4-278
Nitrogen in Stainless Steels *(d)* ..... 1-136
Oxygen-Sand Flame Cutting of Stainless Steels, by G. A. Ukolov, V. N. Chernov and N. N. Korf *(d)* ..... 5-184
Tempering Type 410 Stainless Steel, by Charles F. Lewis ..... 5-88
Vacuum Melted Alloys *(ds)* ..... 2-96B
What's New in Everyday Uses for Metals — Stainless Steels, by Richard E. Paret ..... 4-116

**Steel**
Preview of Space Metals — Steels, Staff Report ..... 4-101

**Steel, alloy**
A.I.S.I. Standard Alloy Steel Composition *(ds)* ..... 4-120B
Tempered Alloy Martensites, by Peter Payson *(d)* ..... 6-138
What's New in Everyday Uses for Metals — Steels . . . Alloy and Carbon, by E. W. Husemann ..... 4-120

**Steel, boron**
Forgeable Iron-Boron Alloys, by T. H. Middleham, J. R. Rait and E. W. Colbeck *(d)* ..... 2-184

**Steel, carbon**
Carbide Phases Produced in High-Carbon Steel, by Morris Mentser *(d)* 4-262
What's New in Everyday Uses for Metals — Steels . . . Alloy and Carbon, by E. W. Husemann ..... 4-120
Yielding of Mild Steel, by J. M. Krafft and A. M. Sullivan *(d)* ..... 4-236

**Steel, cast**
What the Aircraft Maker Wants in a Steel Casting, by L. H. McCreery ..... 1-71

**Steel, controlled density**
Controlled Density Steel, by E. W. Williams *(d)* ..... 2-170

**Steel, copper**
Recrystallization, Structure, Hardness of Copper-Bearing Steels, by R. L. Rickett and W. C. Leslie *(d)* ..... 4-180
Steels Containing Copper, by R. A. Grange, V. E. Lambert and J. J. Harrington *(d)* ..... 4-260

**Steel, rimmed**
Nozzle Sizes for Rimmed Steel, by A. T. Peters *(d)* ..... 2-160

**Steelmaking**
How to Make More Steel, Staff Report ... 5-97
IRSID Opens Pilot-Plant Laboratories, by Our European Consulting Editor ... 2-123

**Steelmaking, electric**
Basic Electric Furnace Refractories, by A. H. Thomson *(d)* ..... 5-174

**Steelmaking, openhearth**
Carbon Control, by K. G. Lewis and J. L. McCracken *(d)* ..... 1-156
Prefabricated Openhearth Fronts, by A. E. Schoenebeck *(d)* ..... 5-178

**Steel sheet**
Strain Aging of Steel Sheet, by E. R. Morgan *(d)* ..... 6-157

**Strategic-Udy process**
A New Direct Reduction Method, by M. J. Udy and M. C. Udy ..... 6-92

**Stresses**
Stress-Raisers in Engineering Parts, by G. A. Cottell *(d)* ..... 3-158

**Superalloys**
High-Temperature Metallurgy Today, by L. P. Jahnke and R. G. Frank ..... 6-86
Preview of Space Metals — Superalloys, Staff Report ..... 4-106
Rolling Sheet in Kokomo *(cp)* ..... 6-67
Vacuum Melted Alloys *(ds)* ..... 2-96B

**Tantalum**
Welding the Refractory Metals, by L. F. Yntema ..... 3-105

**Tempering**
Tempered Alloy Martensites, by Peter Payson *(d)* ..... 6-138
Tempering Type 410 Stainless Steel, by Charles F. Lewis ..... 5-88

**Tensile test**
Something New in Testing Machines *(sr)* ..... 6-118

**Testing machines**
Something New in Testing Machines *(sr)* ..... 6-118

**Thorium**
Powder Metallurgy of Uranium and Thorium, by Alan Blainey ..... 2-79

**Titanium**
Blanking and Forming Titanium, by W. A. Mays and G. J. Matey *(d)* ..... 2-156
Brittle Fracture of Titanium, by R. I. Jaffee and D. N. Williams *(d)* ..... 4-244
Growth of the Titanium Industry, by Paul M. Tyler ..... 1-97
Heat Treatment of Ti for Stress Stability at High Temperature, by M. L. Greenlee, G. A. Lenning, W. M. Parris and H. D. Kessler *(d)* ..... 4-248
How to Avoid Hydrogen Pickup in Descaling Titanium Alloys, by Q. D. Wheatley ..... 6-112
Hydrogen-Induced Delayed Failure in Titanium, by R. D. Daniels, R. J. Quigg and A. R. Troiano *(d)* ..... 4-268
Hydrogen Tolerance of Titanium Alloys, by D. N. Williams, F. R. Schwartzberg and R. I. Jaffee *(d)* ..... 4-244
Present and Future Uses of Titanium, by Paul M. Tyler ..... 3-109
Preview of Space Metals — Titanium, Staff Report ..... 4-102
Quenching Titanium Under Inert Atmosphere, by E. C. Buckingham *(sr)* 5-115
Rate Process Theory for Heat Treatment of Titanium, by N. M. Erkun *(d)* ..... 4-240
The Titanium Situation, by Herbert H. Kellogg *(d)* ..... 1-185
Thermal and Load-Cycling Fatigue Tests, by Harry Majors, Jr. *(d)* ..... 4-184
Titanium Alloy for 1100°F. *(sr)* ..... 6-117
Titanium in Cast Iron, by P. E. Hegmegee, Jr., *(c)* ..... 6-122
Titanium in Fuming Nitric Acid Environment, by John B. Rittenhouse *(d)* ..... 4-220
Titanium in Nodular Cast Iron, by A. Tominaga, I. Aoki and T. Tottori *(sr)* ..... 2-116
Welding Titanium, by Karl Bungardt and Klaus Rudinger *(d)* ..... 1-184
Why Should I Use Titanium? by Paul M. Tyler ..... 2-110

**Toolsteels**
Vacuum Melted Alloys *(ds)* ..... 2-96B

**Transformation diagrams**
Cooling Transformation Diagrams for A.I.S.I. 4024 and 52100, by R. C. Hess and D. J. Blickwede *(ds)* ..... 1-96B
Cooling Transformation Diagrams for A.I.S.I. 4815 and 43BV14, by R. C. Hess and E. Kozic *(ds)* ..... 5-96B

**Tubing**
Fatigue Failures in Hydraulic Tubing, by John O. Almen *(c)* ..... 5-118
How to Make Hydraulic Tubing Last Longer, by C. S. Yen and J. L. Waisman ..... 1-88
Resistance Welded Tube Joints in Heat Exchangers, by J. J. Mueller ..... 6-106

**Tumbling**
Abrasive Tumbling, by H. R. Letner *(d)* 4-191

**Tungsten**
Welding the Refractory Metals, by L. F. Yntema ..... 3-105

**Turbines**
Another Turbogenerator Failure, by R. James Landrum ..... 3-91

**Uranium**
Better Metallographic Techniques . . . Metallography of Disturbed Uranium Surfaces, by H. P. Roth and R. B. Russell ..... 4-140
Heat Treatment of Zirconium-Uranium Alloys, by W. Chubb and F. A. Rough *(d)* ..... 4-194
Identification of Uranium Inclusions, by G. L. Kehl, Eric Mendel, E. Milio Jaraiz and M. H. Mueller *(d)* ..... 4-256
Powder Metallurgy of Uranium and Thorium, by Alan Blainey ..... 2-79
Preparation of Arc-Melted Uranium Carbides, by R. J. Gray, W. C. Thurber and C. K. H. DuBose ..... 1-65
Preparing Uranium Powder Metal Compacts, by Herbert S. Kalish *(d)* ..... 4-176
Properties of Heat Treated Uranium Alloy, by E. G. Zukas *(d)* ..... 4-201

**Vacuum melting**
A User Looks at Cleanliness of Vacuuming Melted Alloys, by Donald E. Nulk 2-103
Production of Discaloy by Vacuum Arc Melting, by D. R. Carnahan ..... 2-100
Vacuum Melted Alloys *(ds)* ..... 2-96B
Vacuum Melting Today, Staff Report 2-94

**Vacuum refining**
Vacuum Degassing, by John N. Hornak and M. A. Orehoski *(d)* ..... 2-142
Vacuum Degassing at Bethlehem, by J. H. Stoll *(d)* ..... 2-146

**Vacuum techniques**
Homogeneous Steel *(cp)* ..... 6-63
Vacuum Furnace for 3000°F. *(sr)* ..... 2-116

**W-545 alloys**
W-545 . . . A Better Turbine Disk Alloy, by J. T. Brown ..... 2-87

**Waste disposal**
Disposal Plant for New Plating Facility, by G. J. O'Kane *(d)* ..... 1-178

**Wear**
Abrasion Resistance of Weld Deposits, by E. I. Leynachuk *(d)* ..... 2-150

**Welding**
Edge-Welding Small Containers, by D. W. Grobecker ..... 5-104
Joining Problems Aired, reported by J. L. McCloud ..... 1-93
Weld Cracking in Magnesium Alloys, by C. L. Kobrin and R. A. Dodd *(d)* 4-197
Welding Nickel and Nickel Alloys, by George R. Pease *(d)* ..... 4-274
Welding the Refractory Metals, by L. F. Yntema ..... 3-105
Welding Titanium, by Karl Bungardt and Klaus Rudinger *(d)* ..... 1-184

**Welding, arc**
Chlorine Improves Aluminum Weld, by M. R. Kasen and A. R. Pfluger *(d)* ... 3-145

**Welding, electron beam**
Welding by Electric Beam, by W. L. Wyman, *(d)* ..... 2-178

**Welding, resistance**
Heat Program Timer Improves Resistance Welds, by Burton B. Stuart ..... 5-109
Resistance Welded Tube Joints in Heat Exchangers, by J. J. Mueller ..... 6-106

**Welding rods**
Nodular Iron Welding Rod Containing Cerium, by R. O. Day, J. S. Snyder and H. V. Inskeep *(d)* ..... 6-182

**Welds**
Design Allowables in Weldments *(ep)* ... 6-66
Low-Temperature Toughness of Welds for Storage Tanks, by B. F. Lebedev *(d)* ..... 6-184

**Wire**
Production of Fourdrinier Wire, by J. Waring *(d)* ..... 3-154
Testing Adhesive Strength of Metallic Coatings, by E. A. Franks *(d)* ..... 6-154

**Words**
Words Are Funny Things, by Frank Kerze, Jr. *(c)* ..... 3-116

**Workability**
Improved Methods of Deep Drawing, by Our Special Correspondent ..... 2-84

**Yielding**
Yielding of Mild Steel, by J. M. Krafft and A. M. Sullivan *(d)* ..... 4-236

**Zirconium**
A Lesson in Fabricating Nuclear Parts, Staff Report ..... 2-68
Calcium Reduction of Zirconium, by O. N. Carlson, F. A. Schmidt and H. A. Wilhelm *(d)* ..... 3-194
Heat Treatment of Zirconium-Uranium Alloys, by W. Chubb and F. A. Rough *(d)* ..... 4-194


***(aa)* Atomic Age; *(br)* Book Review; *(c)* Correspondence; *(cp)* Critical Points; *(d)* Digest; *(ds)* Data Sheet; *(sr)* Short Runs**

# Author Index


Adams, Richard W. (d) ....5-136
Allen, N. P. (d) ....4-284
Almen, John O. (c) ....5-118
Aoki, I. (sr) ....2-116
Backofen, W. A. (d) ....4-216
Ballard, D. B. (sr) ....5-114
Barnitz, R. W. (d) ....5-140
Barrett, Charles S. (reviewer) (br) ....5-95
Barry, J. M. (d) ....4-228
Bastien, Paul G. (d) ....4-288
Beaver, H. O., Jr. ....5-1000
Bengtsson, K. I. (d) ....1-176
Bennett, J. A. (sr) ....5-114
Bishop, Tom ....6-114
Bittner, T. P. (d) ....4-198
Black, W. A. (d) ....2-152
Blainey, Alan ....2-79; 3-95
Blickwede, D. J. (ds) ....1-96B
Brown, J. T. ....2-87; 5-83
Brown, W. F., Jr. (d) ....4-208
Brues, Austin M. (c) ....5-120
Bryan, W. T. ....6-102
Buckingham, E. C. (sr) ....5-115
Bungardt, Karl (d) ....1-184
Cannistraro, N. I. ....5-111
Cape, A. T. (Supersonic Age) ....3-99
Carlson, O. N. (d) ....3-194
Carnahan, D. R. ....2-100
Chakravarty, P. K. (d) ....5-182
Chernov, V. N. (d) ....5-184
Chubb, W. (d) ....4-194
Clark, Donald S. (br) ....1-110; (d) 4-256
Clausing, R. E. (d) ....4-256
Cobaugh, G. D. (d) ....5-138
Colbeck, E. W. (?) ....2-184
Colwell, D. L. ....4-127
Cottell, G. A. (d) ....3-158
Couling, S. L. (d) ....4-202
Croan, L. S. (d) ....4-188
Crooks, S. R. ....6-68
Daniels, R. D. (d) ....4-268
Day, R. O. (d) ....6-182
Decker, John E. ....3-71
Deronja, F. S. (d) ....4-214
Dickinson, J. M. ....4-142
DuBose, C. K. H. ....1-65
DuMond, T. C. (cp) ....5-66; 5-68, 6-84
Eagan, Thomas E. ....4-118
Eichelberger, T. W. (d) ....4-266
Emond, Lloyd (ds) ....3-96B; 3-97
Erkun, N. M. (d) ....4-240
Everitt, Leo N. ....6-74
Fields, D. S., Jr. (d) ....4-216
Finlay, Walter L. (d) ....3-134
Flinn, Paul A. (reviewer) (br) ....2-115
Fountain, R. W. (d) ....4-252
Frank, R. G. ....5-77; 6-86
Franks, E. A. (d) ....6-154
Fry, S. L. (d) ....5-156
Gensamer, M. (d) ....4-214
Grange, R. A. (d) ....4-198; (d) 4-260
Gray, R. J. ....1-65; 4-145
Greenlee, M. L. (d) ....4-248
Greever, James E. ....1-83
Grobecker, D. W. ....5-104
Hampe, W. R. (d) ....1-130
Harrington, J. J. (d) ....4-260
Hauth, C. R. (d) ....5-138
Heard, F. P. (c) ....6-120
Hegmegee, P. E., Jr. (c) ....6-122
Heim, Arthur I. ....4-128
Hendrickson, J. A. (d) ....4-250
Hess, R. C. (ds) ....1-96B; (ds) 5-96B
Hirschler, H. Peter (c) ....3-116
Hoffman, C. F. ....3-67
Hofmaier, Josef (d) ....2-174
Hooper, J. H. (d) ....1-142
Hornak, John N. (d) ....2-142
Husemann, E. W. ....4-120
Hyslop, Marjorie R. ....1-108
Inskeep, H. V. (d) ....6-182
Jaffee, R. I. (d) 4-210; (d) 4-230; (d) 4-244
Jahnke, L. P. ....5-77; 6-86
Jaraiz, Emilio (d) ....4-256
Jones, Rodney A. ....1-78
Kalish, Herbert S. (d) ....4-176
Kasen, M. B. (d) ....3-145
Kehl, G. L. (d) ....4-256
Keller, F. ....4-114
Kellog, Herbert H. (d) ....1-185
Kemmis, O. H. (d) ....4-270
Kerze, Frank, Jr. (c) ....3-116
Kessler, H. D. (d) ....4-248
Keyser, W. B. ....5-90
Kilhefner, P. T., Jr. (d) ....4-198
Kinderman, Walter J. (br) ....6-116
Klodt, Donald T. (c) ....6-120
Klopp, William D. (d) ....4-210; (d) 4-230
Kobrin, C. L. (d) ....4-197
Korchynsky, M. (d) ....4-252
Korf, N. N. (d) ....5-184
Kozik, E. (ds) ....5-96B
Kraft, J. M. (d) ....4-236
Kropf, Charles J. ....3-86
Lagerberg, Vincent O. (c) ....3-116
Lambert, V. E. (d) ....4-260
Landrum, R. James ....3-91
Lebedev, B. F. (d) ....6-184
Lenning, G. A. (d) ....4-248
Leslie, W. C. (d) ....4-180
Letner, H. R. (d) ....4-191
Lewis, Charles F. ....5-88
Lewis, K. G. (d) ....1-156
Leynachuk, E. I. (d) ....2-150
Lloyd, H. K. (c) ....2-128
Long, E. L. ....4-145
Loofboro, K. S. (d) ....5-136
Majors, Harry, Jr. (d) ....4-184
Malone, R. F. (d) ....3-134
Manly, W. D. (d) ....4-256
Manning, G. K. ....5-94
Manson, S. S. (d) ....4-208
Matey, G. J. (d) ....2-156
Mays, W. A. (d) ....2-156
McCloud, J. L. ....1-93; 2-75; 4-130
McCracken, J. L. (d) ....1-156
McCreery, L. H. ....1-71
McIntire, H. O. ....5-94
McLaughlin, J. K. ....1-105
McManis, Robert J. (c) ....6-120
Mendel, Eric (d) ....4-256
Menster, Morris (d) ....4-262
Middleham, T. H. (d) ....2-184
Miller, R. A. ....6-98
Mueller, J. J. ....6-106
Mueller, M. H. (d) ....4-256
Morgan, E. R. (d) ....6-157
Nelson, C. E. ....4-125
Nock, J. A., Jr. ....4-114
Nulk, Donald E. ....2-103
Obinata, Ichiji (d) ....4-174
O'Kane, G. J. (d) ....1-178
Olsson, A. E. ....2-91
Orehoski, M. A. (d) ....2-142
Pagano, Victor H. ....3-86
Paret, Richard E. ....4-116
Parris, W. M. (d) ....4-248
Pashak, J. F. (d) ....4-202
Patriarca, P. (d) ....4-256
Payson, Peter (d) ....6-138
Pease, George R. (d) ....4-274
Pendleton, J. S., Jr. ....5-100
Peters, A. T. (d) ....2-160
Pfluger, A. R. (d) ....3-145
Philbrook, W. O. ....3-113
Quigg, R. J. (d) ....4-268
Rait, J. R. (d) ....2-184
Rickett, R. L. (d) ....4-180
Rider, D. K. ....3-81
Rittenhouse, John B. (d) ....4-220
Rizzitano, F. L. (d) ....4-188
Robinson, R. C. (d) ....5-160
Rogers, Bruce A. ....5-108
Rosa, W. F. (c) ....3-116
Roth, H. P. ....4-140
Rough, F. A. (d) ....4-194
Rudinger, Klaus (d) ....1-184
Russell, R. B. ....4-140
Samans, C. H. (d) ....4-178
Samuels, L. E. (d) ....4-278
Schaller, F. W. (d) ....4-226
Schmatz, D. J. (d) ....4-264; (d) 5-180
Schmidt, F. A. (d) ....3-194
Schoefer, Ernest A. ....4-129; 6-195
Schoenebeck, A. E. (d) ....5-178
Schwartzberg, F. R. (d) ....4-244
Shakely, H. H. (d) ....5-140
Shandley, John A. (br) ....6-116
Sims, Chester T. (d) ....4-210; (d) 4-230
Smucker, Richard A. (d) ....5-142
Snyder, J. S. (d) ....6-182
Starratt, F. W. (d) ....2-180
Stevenson, Cary H. (c) ....2-128
Stoll, J. H. (d) ....2-146
Stuart, Burton B. ....5-109
Sturkey, L. (d) ....4-202
Succop, G. (d) ....4-208
Sullivan, A. M. (d) ....4-236
Sykes, Clarke ....6-74
Tanaka, Hiroshi (d) ....4-174
Thomson, A. H. (d) ....5-174
Thornton, Kirby F. (c) ....2-126
Thum, E. E. (cp) 2-66; (cp) 5-67
Thurber, W. C. ....1-65
Tisinai, G. F. (d) ....4-178
Tominaga, A. (sr) ....2-116
Tottori, T. (sr) ....2-116
Troiano, A. R. (d) ....4-268
Tyler, Paul M. 1-97; 2-110; 3-109
Udy, M. C. ....6-92
Udy, M. J. ....6-92
Ukolov, G. A. (d) ....5-184
Visvanathan, S. (d) ....5-182
Vordahl, M. B. (d) ....3-134
Waisman, J. L. ....1-88
Wallwork, G. R. (d) ....4-278
Waring, J. (d) ....3-154
Weiss, Myron ....1-86
Weymueller, Carl R. ....(cp) 2-65; (cp) 3-65; (cp) 5-66; (cp) 6-67
Wheatley, Q. D. ....6-112
Wilhelm, H. A. (d) ....3-194
Williams, A. E. (d) ....2-154
Williams, D. N. (d) ....4-244
Williams, E. W. (d) ....2-170
Williams, T. R. G. (d) ....1-182
Wilson, J. E. ....5-83
Wood, D. S. (d) ....4-250
Wyman, W. L. (d) ....2-178
Yen, C. S. ....1-88
Yntema, L. F. ....3-105
Zackay, V. F. (d) ....4-226; (d) 4-264; (d) 5-180
Zinn, W. H. (d) ....6-156
Zukas, E. G (d) ....4-201



Copyright 1958

By

American Society for Metals